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10/708,165

02/12/2004

Stephen Charles Porter

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EXAMINER

ENIN-OKUT, EDU E

ART UNIT

PAPER NUMBER

4132

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/708,165	<b>Applicant(s)</b> PORTER ET AL.	
	<b>Examiner</b> Edu E. Enin-Okut	<b>Art Unit</b> 4132	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-38 is/are pending in the application.
- 4a) Of the above claim(s) 11-24, 34-38 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10 and 25-33 is/are rejected.
- 7) ☒ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. ____.                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>See Continuation Sheet</u> .                                  | 6) <input type="checkbox"/> Other: ____.                          |

Continuation of Attachment(s) 3). Information Disclosure Statement(s) (PTO/SB/08), Paper No(s)/Mail Date :4/20/2006, 5/20/2006, 6/13/2006, 9/18/2006.

## DETAILED ACTION

### *Election/Restrictions*

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
  - I. Claims 1-10 and 16-24, drawn to a system for generating high pressure hydrogen, classified in class 48, subclass 61+.
  - II. Claims 1-10 and 25-33, drawn to regenerative fuel cell system, classified in class 429, subclass 21.
  - III. Claims 1-10 and 34-36, drawn to a health monitoring system for a regenerative fuel cell system, classified in class 48, subclass 61+.
  - IV. Claims 11-15, drawn to a method for generating and storing high pressure hydrogen, classified in class 205, subclass 637.
  - V. Claims 37-38, drawn to a manifold for limited hydrogen flow to a power generator having a fuel cell, classified in class 429, subclass 38.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I-III are related but distinct system combinations. Each invention relies on different elements for patentability not required by the other. Invention I requires a hydrocarbon reformer, whereas Inventions II and III do not. Invention II requires a dc bus, whereas Inventions I and III do not. Invention III requires a first, second and third sensor, whereas Inventions I and II do not.
3. Claims 1-10 link(s) inventions I-III. The restriction requirement between the linked inventions is **subject to** the nonallowance of the linking claim(s), claims 1-10. Upon the indication of allowability of the linking claim(s), the restriction requirement as to the linked inventions **shall** be withdrawn and any claim(s) depending from or otherwise requiring all the limitations of the allowable linking claim(s) will be rejoined and fully examined for patentability in accordance with 37 CFR 1.104 **Claims that require all the limitations of an allowable**

Art Unit: 4132

**linking claim** will be entered as a matter of right if the amendment is presented prior to final rejection or allowance, whichever is earlier. Amendments submitted after final rejection are governed by 37 CFR 1.116; amendments submitted after allowance are governed by 37 CFR 1.312.

Applicant(s) are advised that if any claim presented in a continuation or divisional application is anticipated by, or includes all the limitations of, the allowable linking claim, such claim may be subject to provisional statutory and/or nonstatutory double patenting rejections over the claims of the instant application. Where a restriction requirement is withdrawn, the provisions of 35 U.S.C. 121 are no longer applicable. *In re Ziegler*, 443 F.2d 1211, 1215, 170 USPQ 129, 131-32 (CCPA 1971). See also MPEP § 804.01.

4. Inventions IV and I-III are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another and materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case, the apparatus as claimed can be used to practice a method for generating and storing high pressure gases other than hydrogen (i.e., nitrogen, helium, oxygen).

5. Inventions V and I-III are related as subcombinations disclosed as usable together in a single combination. The subcombinations are distinct if they do not overlap in scope and are not obvious variants, and if it is shown that at least one subcombination is separately usable. In the instant case, the manifold has separate utility such as a manifold for limiting flow of a variety of fluids (i.e., gas or liquid) to a variety of sources other than a power generator. See MPEP § 806.05(d).

The examiner has required restriction between subcombinations usable together. Where applicant elects a subcombination and claims thereto are subsequently found allowable, any claim(s) depending from or otherwise requiring all the limitations of the allowable

Art Unit: 4132

subcombination will be examined for patentability in accordance with 37 CFR 1.104. See MPEP § 821.04(a). Applicant is advised that if any claim presented in a continuation or divisional application is anticipated by, or includes all the limitations of, a claim that is allowable in the present application, such claim may be subject to provisional statutory and/or nonstatutory double patenting rejections over the claims of the instant application.

6. Restriction for examination purposes as indicated is proper because all these inventions listed in this action are independent or distinct for the reasons given above and there would be a serious search and examination burden if restriction were not required because one or more of the following reasons apply:

- (a) the inventions have acquired a separate status in the art in view of their different classification;
- (b) the inventions have acquired a separate status in the art due to their recognized divergent subject matter;
- (c) the inventions require a different field of search (for example, searching different classes/subclasses or electronic resources, or employing different search queries);
- (d) the prior art applicable to one invention would not likely be applicable to another invention;
- (e) the inventions are likely to raise different non-prior art issues under 35 U.S.C. 101 and/or 35 U.S.C. 112, first paragraph.

**Applicant is advised that the reply to this requirement to be complete must include (i) an election of a invention to be examined even though the requirement may be traversed (37 CFR 1.143) and (ii) identification of the claims encompassing the elected invention.**

The election of an invention may be made with or without traverse. To reserve a right to petition, the election must be made with traverse. If the reply does not distinctly and specifically point out supposed errors in the restriction requirement, the election shall be treated as an election

Art Unit: 4132

without traverse. Traversal must be presented at the time of election in order to be considered timely. Failure to timely traverse the requirement will result in the loss of right to petition under 37 CFR 1.144. If claims are added after the election, applicant must indicate which of these claims are readable on the elected invention.

If claims are added after the election, applicant must indicate which of these claims are readable upon the elected invention.

Should applicant traverse on the ground that the inventions are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the inventions to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

7. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

8. During a telephone conversation with Dave Christensen on March 20, 2008 a provisional election was made with traverse to prosecute the invention of II, claims 1-10 and 25-33. Affirmation of this election must be made by applicant in replying to this Office action. Claims 11-24 and 34-38 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

#### ***Information Disclosure Statement***

9. The information disclosure statements filed on September 18, 2006 and June 13, 2006 are duplicates of the statement filed on April 20, 2006.

Art Unit: 4132

***Claim Objections***

10. Claims 10, 25-26 and 31-33 objected to because of the following informalities:

- Claim 10 recites "100 standard cubic centimeters per minute". Applicant should present that limitation in standard cubic feet per hour, i.e., --0.004 scfh--.
- Claim 25 and 31-33 recite "dc" which should be capitalized to --DC--.
- Claim 26 recites "buss" which appears to be a misspelling of the word --bus--.

Appropriate correction is required.

***Specification***

11. The disclosure is objected to because of the following informalities: The specification continuously refers to an "unregulated dc bus" and a "common dc bus". The "dc" used in these terms should be capitalized to --DC--. Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

13. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

14. Claim 26 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 26 recites the limitation "said fuel cell module unregulated dc buss". There is insufficient antecedent basis for this limitation in the claim.

***Claim Rejections - 35 USC § 103***

15. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.



Art Unit: 4132

16. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

17. Claims 1-7 and 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Johnson et al., U.S. Patent No. 7,160,639 in view of Pearson et al., U.S. Patent Application Publication No. 2004/0126641.

With respect to claim 1, Johnson teaches a system for generating high pressure hydrogen comprising a low pressure hydrogen generator and a high pressure hydrogen generator (column 3, lines 59-65; column 3, line 66 – column 4, line 4).

Johnson et al. teaches a reversible engine that converts heat to electrical energy composed of a conduit system, a first electrochemical cell, and a second electrochemical cell (Abstract; column 2, lines 32-36). The conduit system is in fluid communication with the first and second electrochemical cells (column 2, lines 32-40). During operation, the first and second electrochemical cells generate hydrogen (column 3, lines 57-59; column 4, lines 10-12). The first electrochemical cell operates at a higher pressure than the second electrochemical cell (column 3, line 59 – column 4, line 18).

One would appreciate that the high pressure hydrogen generator of Johnson et al. would be capable of producing hydrogen at a low volume and its low pressure hydrogen generator would be capable of producing the gas at a high volume. However, Johnson et al. is silent as to a storage container and that container being fluidly coupled to the storage tank.

It is known in the art that a hydrogen generator can be connected to a hydrogen storage system as taught by Pearson et al. (Abstract; Paragraph 59). One of ordinary skill in the art would

Art Unit: 4132

appreciate that a hydrogen storage system can include a storage container. Therefore, it would have been obvious to that artisan at the time of the invention to connect the storage container of Pearson et al. to the hydrogen generators of Johnson et al., as modified by Vaseen and Gomez, since it serves as a simple, efficient means to hold a supply of hydrogen for future use.

Regarding claims 2-4, one would appreciate that the low and high pressure hydrogen generators of Johnson et al., as modified by Pearson et al., would be capable of generating hydrogen at the pressures recited in claims 2-3 and 4-5, respectively.

Regarding claims 6 and 7, the limitations in these claims have been addressed above with respect to claim 1.

Regarding claims 9 and 10, one would appreciate that the low and high pressure hydrogen generators of Johnson et al., as modified by Pearson et al., would be capable of generating hydrogen at the rates recited in claims 9 and 10, respectively.

18. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Johnson et al. as applied to claim 1 above, further in view of Vaseen, U.S. Patent No. 4,226,683.

With respect to claim 8, Applicant is directed to previous paragraphs for a discussion of Johnson et al. and Pearson et al.

Regarding claim 8, Vaseen discussed above also teaches a how to produce hydrogen using coal and carbon particulates with water (Abstract). One of ordinary skill in the art would appreciate that coal is a material rich in hydrocarbons. It would have been obvious to that artisan at the time of the invention to use the hydrocarbon reformer of Vaseen as the low pressure hydrogen generator of Johnson et al., as modified by Pearson et al., since it reduces the energy demand of the process by assisting the electrochemical breakdown of hydrogen due to the presence of carbon as an oxygen recipient.

19. Claims 25-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pearson et al., U.S. Patent Application Publication No. 2004/0126641 (hereinafter referred to as Pearson et

Art Unit: 4132

al. '641), in view of Jacobson et al., U.S. Patent Application Publication No. 2004/0095203, and Pearson et al., U.S. Patent Publication Application No. 2004/0126632 (hereinafter referred to as Pearson et al. '632).

With regard to claim 25, Pearson et al. '641 teaches a regenerative fuel cell system (Abstract) comprising:

- at least one hydrogen storage container (Abstract; Paragraph 59);
- at least one hydrogen generator fluidly coupled to said storage container (Abstract; Paragraphs 59, 62); and,
- at least one power generator (Paragraph 36), each power generator including a fuel cell fluidly coupled to said storage container (Abstract; Paragraphs 36, 62), and an electric storage device (Paragraph 82).

Pearson et al. '641 teaches an electric power plant that generates power using an array of fuel cell systems comprised of a regenerative fuel cell stack and fuel supply and hydrogen storage systems used to supply hydrogen to, and store hydrogen from, the stack (Abstract; Paragraphs 36, 49, 59). The array can include a power bus and a first arm made of a plurality of fuel cell systems electrically couplable to the power bus and in series to each other (Paragraph 21). The array can also include a second arm of a plurality of fuel cell systems electrically couplable to the power bus, in series to each other, and in parallel to the first arm (Paragraph 21). These fuel cell systems may also include an electrical storage device (Paragraphs 46, 82). The power plant may be configured as a DC power plant or an AC power plant and include either a rectifier or an inverter (Paragraph 22).

One of ordinary skill in the art would appreciate that the power bus taught by Pearson et al. '641 can handle either AC or DC (i.e., a power AC bus or a power DC bus) because that power plant can be configured as plant that produces either type of power. However, Pearson et al. '641 is silent as to a regenerative fuel cell system having an unregulated DC bus electrically

Art Unit: 4132

connected to said fuel cell and said electric storage device, and a DC/DC converter electrically connected to said unregulated dc bus.

As to a regenerative fuel cell system having an unregulated DC bus electrically connected to said fuel cell and said electric storage device, it is known in the art that a power system can include one or more common power sources, such as a battery, a generator or a fuel cell, and those sources include subsystem components such as regulated, unregulated and common buses interconnected to the common power source, as taught by Jacobson et al. (Abstract; Paragraphs 27-28, 43). That configuration of components allows the system to detect and isolate failed segments of the system and reconfigure to restore power (Abstract).

Jacobson et al. discloses the unregulated bus and common bus except for those devices being used with direct current (DC). One of ordinary skill in the art would appreciate that a bus is configured appropriately in order to direct the current of the nature produced by a system, be it AC or DC. Therefore, it would have been obvious to that artisan at the time of the invention to electrically connect an unregulated DC bus to the fuel cell and electrical storage device of Pearson et al. '641, as taught by Jacobson et al., since the bus is known in the art as means to direct current from variable current devices.

As to a DC/DC converter electrically connected to said unregulated dc bus, it is also known in the art that an electric power plant with a regenerative fuel cell system that produces, and consumes, hydrogen can include inverters and/or DC/DC converters as part of its power supply system, as taught by Pearson et al. '632 (Abstract; Paragraph 50). That power supply system provides power to AC or DC loads, respectively (Abstract; Paragraph 50). One of ordinary skill in the art at the time of the invention would have found it obvious to electrically connect the DC/DC converter of Pearson et al. '632 to the unregulated DC bus of Pearson et al. '641, as modified by the teachings of Jacobson et al., because it allows the use of DC produced

Art Unit: 4132

by the regenerative fuel cell system to be converted for use in a variety of devices with different load needs.

Regarding claim 26, Jacobson et al. discussed above teaches a common bus can be interconnected to a power source, such as generator or a fuel cell, and number of other subsystem components, such as an unregulated bus. One of ordinary skill in the art would readily appreciate that a common bus can be one used for DC, i.e., a common DC bus. Therefore, it would have been obvious to that artisan at the time of the invention to electrically connect the hydrogen generator and unregulated DC bus of Pearson et al. '641 to a common DC bus, as taught by Jacobson et al., since a common DC bus is used to distribute electrical power to components of a system.

Regarding claim 27, Pearson et al. '632 discussed above teaches a regenerative fuel cell system comprising of a water storage unit fluidly coupled to said at least one hydrogen generator (Abstract; Paragraphs 30, 35-36, 49). The reference teaches that has a water supply, such as a hot water heater, providing water to an injector that introduces a fine stream of water into the oxidant stream (Paragraph 36). The oxidant stream is supplied to the regenerative fuel cell stack (Paragraph 35). The reference also teaches that the water recovered from the anode and cathode exhaust of the regenerative fuel cell stack the can be recovered, directed to the water supply, and stored for hydrogen generation purposes (Paragraph 30, 49). One of ordinary skill in the art would appreciate that a water supply composed of hot water heater which can store water for future use serves as a water storage unit. It would have been obvious to that artisan to fluidly couple the water storage unit of Pearson et al. '632 to a hydrogen generator of Pearson et al. '641, as modified by Jacobson, because it can serve as an integral part of the hydrogen generation process and a water recovery system.

Regarding claim 28, the limitations of this claim have been addressed above with respect to claims 25 and 27.

Art Unit: 4132

Regarding claim 29, Pearson et al. '641 teaches a regenerative fuel cell system further comprises of a user interface electrically connected to said power generator, said storage container and said first and second hydrogen generators (Abstract; Paragraph 21, 36, 39, 49).

Regarding claim 30, the limitations recited in this claim has been addressed with respect to claim 29 above.

Regarding claim 31, Pearson et al. '641 discussed above teaches that a regenerative fuel cell stack can be electrically connected to a power bus used with either AC or DC. However, that reference is silent as to that bus being an unregulated DC bus. Jacobson et al., also discussed above, teaches an unregulated bus interconnected to a power source, such as generator or a fuel cell. It has been addressed above that one of ordinary skill in the art would appreciate that an unregulated bus can be used for either AC or DC. Thus, it would have been obvious to one of ordinary skill in the art to electrically connect the unregulated bus of Jacobson et al. to the regenerative fuel cell system of Pearson et al. '641 since that device is known in the art to as means to direct current from variable current devices.

Regarding claim 32, the limitations recited in this claim are addressed above with respect to claims 25 and 31.

Regarding claim 33, the limitations recited in this claim have been addressed above with respect to claims 25, 29 and 31.

#### ***Correspondence / Contact Information***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edu E. Enin-Okut whose telephone number is 571-270-3075. The examiner can normally be reached on Monday-Thursday, 8 a.m. - 4 p.m.

Art Unit: 4132

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jessica Ward can be reached on 571-272-1223. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Edu E Enin-Okut/  
Examiner, Art Unit 4132

/Jessica L. Ward/  
Supervisory Patent Examiner, Art Unit 4132